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CYBERNETIC ANALYSIS OF A SIMULATED
INTERNATIONAL THREAT SYSTEM:
PRINCIPLES AND PROCEDURES

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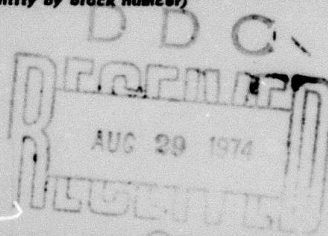
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Cybernetic Analysis of a Simulated International
Threat System: Principles and Procedures

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August, 1974

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Threat Recognition and Analysis Project

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Cybernetic Analysis of a Simulated International
Threat System: Principles and Procedures

Introduction

Man, however crude, temporary and frail, is a fascinating object of scientific inquiry. He is the epitome of contradiction and inconsistency. He constructs and destroys, loves and hates, works and loafs; he is rational and irrational, sensitive and insensitive, wise and foolish. But no human quality is perhaps more fascinating than man's efforts to work against Clausius' second law of thermodynamics. According to its most modern form, the second law stipulates that the universe is breaking down structurally and running down dynamically. It is moving from an initial state of maximum order through successive, intermediate states of reduced order to a final state of disorder. This final state is a condition described by a uniform distribution of energy and information. It is a state of pure chaos, complete disorganization, total randomness. Man, as well as some other animate material systems, is one sector in the universe whose efforts directly oppose this disorganization tendency of the cosmos.

The principal strategy man employs to avert chaos and extend order is to capture and store the free energy and information in the environment. Once captured, energy and information are integrated into man's life support systems to sustain and upgrade the quality of life. They allow man to exert control over his environment, or portions thereof, and to constrain it in directions he deems appropriate. The biological aspect of this activity, which deals primarily with the energy side of the issue, is well documented and understood. Plants obtain energy from the sun's radiation which is transformed into organic compounds by photosynthesis. Animals, including man, receive energy from plants or from other animals. But this activity is not restricted to biological functions alone. In humans the processes of adjustment and adaptation to the environment (via energy and information) are conducted by somatological and extrasomatological mechanisms. Language, culture, tradition, belief structures, tools, industry, games, rituals, diplomacy, social norms, art, etc. are all manifestations of these extrasomatological mechanisms. The very fabric of society is woven by human processing of information and energy expenditure.

This total process is what Schrodinger called ". . . sucking orderliness from the environment . . . feeding on

negative entropy . . . ." (Schrodinger, 1944: 71-72) Man is particularly adroit at arresting the loss of energy and information. History is marked with his efforts to construct energy-conserving tools, and information processing systems. To facilitate this, man relies on his unique ability to express his environment symbolically in synthetic form. A convenient vehicle for this expression is a model. Models are designed to replicate the environment's essential behavior without permitting that behavior to be clouded by noise, clutter and distortions. Simplified, isolated, insulated and most importantly, accessible to man, the model is designed to generate the unadulterated behavior of the environment. This generation is unquestionably artifical and synthetic, but it is free from unmanageable variability and distortion. The model is crude in comparison to the environment. Even the most sophisticated models lack the richness of detail inherent in the environment, but they are also unencumbered by undue elaboration. Models are valuable if they accurately highlight the most salient behavioral regularities of the environment, and filter out the unnecessary variation which frequently encompasses the patterns of important, repetitive behavior.

Once formulated, man works with the model of the environment rather than the environment itself. The reason for this is obvious. The model is synthetic, man-made, and amendable to human manipulation. The environment, on the other hand, is more difficult to affect frontally. Its complexity, variety and detail make it less amendable, even resistive to man's direct efforts to control and/or alter environmental behavior. The model is used as an interface between man and the environment. If the model is an appropriate re-casting of the environment's essential behavior then man's chances for ultimately exerting control over the environment are enhanced considerably. Models may be highly abstract, highly philosophical on the one hand, or highly concrete and material on the other. As the model is refined and understood, man sets about to fashion tools and/or machines on the basis of information gleaned from studying the behavior of the model. These aids are designed to monitor automatically the behavior of the environment, recognize its regularities and finally exert control over it. Ultimately man's tools and machines serve the functions of arresting or constraining forces external to himself for the purpose of preserving and storing excess energy and information. The end is to use the environment's structure and dynamics to satisfy ends already predetermined by man as desirable.

The adequacy of these models and the accuracy of the

information they produce about the environment is constantly challenged. Daily, man encounters the problems of adjustment to habitat. In one way or another, he faces the issues of subsistence, persistence, protection from others and from the environment. This activity is engaged in under the most arduous conditions. For the most part, the environment is extremely complex, ever changing, and largely untamed. In a word,-- it is very difficult to model. Tomorrow holds only uncertainty; today is probably a precursor of tomorrow but its revelations come discretely and faintly, yielding only very begrudgingly clues about the future. Yesterday, for all of its importance, for all of the learning, is only dimly recalled, and even then, in distorted form. To compound the dilemma further, man's own sense of presence, his own self-aware existence interferes with filtering from time (i.e., from history) and from the environment the necessary information and energy he needs to subsist and persist meaningfully.

To adjust, to adapt, to cope with the environment, man is obliged to watch it carefully, encoding its variability and recording its regularities. The most intelligent behavior of man is to classify and arrange these regularities into information about tomorrow. Man guards himself against tomorrow's uncertainty by calling out of the past principles of regularity and patterns which portend the nature of the future. He anticipates the future partially to reduce his insecurity about it, partially to upgrade the quality of his present existence, and partially to protect himself against foreboding ruin. He must be prepared for, and braced against, future contingencies both good and bad. If tomorrow threatens either the continuance or quality of life then man is best served if his sentinel system has already alerted him to such a prospect.

It is reasonable enough to assert that man needs to monitor, model, and mold the environment if he wants to enjoy the advantages of a designed, purposive existence. In those environments where rates of change are genuinely slow; variety is restricted; repetitive behavior is easily recognized and recorded; -- the principles and procedures for monitoring, modelling and molding are straight-forward and effective. But where inverse conditions prevail, these tasks are not easily resolved. In environments, such as the international environment--where changes are rapid, variety unrestrained, repetitive behavior disguised--monitoring systems are time consuming, inaccurate and confusing. Models are overly simple and deceiving. Molding is unworkable, even impossible. Few guidelines exist for such environments. To both the most casual observer and the most systematic

student, the international environment seems the classic example of complexity, rapid change, incessant variety, time-delayed cause, constant fluctuation, and discrete, idiographic events. Its variety appears infinite. It has few, if any, recognized points of control. It operates on principles of universal sovereignty, self-determination and independence; it pits the immovable object against the irresistible force.

In the broadest sense, the principles and procedures presented here deal with the question of how to monitor the international environment. Basically the inquiry is to determine whether information can be drawn from the daily flow of international events, and encoded into patterns of repetitive behavior which clue the future, especially when that future is potentially ruinous. Theoretically systems theory and cybernetics constitute a solid foundation for this inquiry, both its design and analysis. Methodological guidelines are provided by the event data and simulations approaches to international relations. These theoretical and methodological approaches are combined to expedite the search for "situational threats" in the international environment. Situational threat, as distinct from an "issued threat," refers to a state of affairs in the international environment which implicitly portends a coming state of disaster or ruin. This state of affairs is neither clearly "announced" nor "declared," as in the case of the issued threat, but is inherent in the unfolding sequence of affairs between states. It is subtle and finely-spun into the totality of international interaction. The task is to filter out those indicators which alert the sentinel system to future calamity. The idea is to recognize and analyze a situational threat before conditions become discommoding.

The Design: Research Questions and Considerations

The design and questions discussed in this research are dependent on several theoretical insights and interests suggested in the work already completed during the first year of TR&A (Threat Recognition and Analysis Project), and in the proposal for the second and third years of financial support by ARPA. (McClelland, 1973; McClelland, 1974; Ramsey, 1974; Martin, 1974)
The key feature of all of this work is the recognition of threats. As Ramsey (1973) and Druckman (1973) have pointed out in their reviews, considerable empirical work has already been conducted by social psychologists on threats. This research, though an invaluable source of information, is primarily confined to what McClelland has described as only one of the two faces of situational

threats, namely the subjective, image, pre-vision side. (McClelland, 1974:7) This research is further restricted because it is often solely concerned with issued threats and not situational threats at all.

The other face of situational threats, i.e., the objective side, has, with the possible exception of the military dimension, been somewhat neglected. The reasons for this neglect are multiple and need not be explicated here, but it may be said with some confidence that (1) the definition of threat has long been restricted to common sense specification and/or to "issued" threats, and (2) few methodologies exist specifically to monitor non-military situational threats as they move dynamically through successive states of "undesirability." This research attempts to expand the concept of situational threat and explore the overarching question of how to monitor international threat systems. In sum, its general theoretical and empirical objectives are to focus on the subjective and objective dimensions of situational threats, and to develop and test methodologies for monitoring the change steps of threat processes.

The design procedures adopted to achieve these ends are: (1) to construct a synthetic determinate international event future; (2) to inlay that future with situational threats; (3) to present that synthetic, inherently threatening future to three experimental subjects (Ss) in a simulated form; (4) to permit interaction and communication between the experimental subjects which can affect, even alter, the strictly determinate path of the international future; (5) to employ both systems and cybernetic notions to construct the future and to analyze the subjects' responses to the event sequence and to one another; and, (6) to capitalize on a number of social psychological strategies to identify the subjective aspects of recognizing and responding to situational threats. The event data approach is used as a model of the international environment and the data it generates can be used to reconstruct a simulated, synthetic international future. (McClelland, 1973a) Notions of systems and cybernetics serve to fabricate and analyze the event-interaction sequences. An interactive, terminal-oriented computer program (written in PL/1) will: (1) present the synthetic future to the subjects; (2) transmit and record all their communications; (3) record all protocols; (4) calculate all systemic impact values and allocate new event-interaction futures; (5) provide tabular and time-series information to the subjects at their request; and, (6) record for future analysis all pattern changes in the simulation. Also, personality profiles will

be established (using the California Personality Inventory)
for all of the experimental subjects, and observations will
be made periodically throughout the simulation to measure
their perceptions of the flow of international events and
their opinions of the other subjects' behavior.

The intent of this procedure is to answer a battery of
questions. How and when do subjects in a man-machine
simulation of the flow of international events recognize
situational threats? Which incidences are categorized as
potentially ruinous and which are not? When and under what
circumstances do subjects act to alter the dynamics of a
situational threat? How will they act to affect one
another's perceptions of the synthetic future and their
behavior toward it? If a negotiation period commences, what
are the step change sequences in the bargaining process?
What type of an arrangement, if any, is achieved and under
what circumstances? What are the perceptions subjects hold
of the event flow and of any situational threats in the
flow? What are the subjects' perceptions of each other's
strategies during normal event-interaction, communication
and negotiation periods? What is the relationship between
the subjects' personality structure and (1) the acts they
undertake to avert states of future undesirability, (2)
their recognition of situational threats, and (3) their
perception of the event flow and the other participants'
behavior? This battery of questions constitutes a formidable
group any one of which could be independently investigated.
But in a man-machine simulation where the analyst has the
advantage of a higher degree of control than he might have
in a field study for example, it is possible to permit and
handle this level of complexity. Furthermore, these
questions are based on the assumption that the answers are
constantly changing as the synthetic future is unfolded.
Cybernetics, as a method for the analysis of complex
systems, is designed to handle both the complexity and
change this situation creates. It uses the difference (i.e.,
the change) of one state from its preceeding state as the
basic unit of cybernetic inquiry. The principles of
cybernetics inherent in the design and analysis of this
simulated, synthetic threat system (referred to as the
Threat Recognition and Analysis Simulated System, or TRASS)
treat the recognition that one state of TRASS is different
than another, or has changed into another state, as the most
fundamental analytic construct. Whether experimental
subjects can recognize change, especially when the
difference between one state and its successive states
reflects deterioration, and if they can, "when", is the crux
of the inquiry.

Though multiple and complex, these questions cover four issue clusters of extreme importance to the systemic, change step analysis intended by the study. These issue clusters are: (1) can experimental subjects read a stream of international event-interactions which model a synthetic, futuristic international environment, and recognize the situational threats inherent in that stream of events; (2) if the Ss recognize a situational threat, what steps do they take to avert the foreboding ruin they anticipate; (3) what are their perceptions of the event stream, of their own behavioral responses to that stream, and of the other participants' behavior in the simulation, and (4) what changes occur in recognition, response and perception during the entire process? This latter cluster includes valuable information about the learning, behavioral modification and changes in perception which will be experienced during the simulation.

TRASS: The Procedure

The theoretically important question in this study is to determine how, when and under what circumstances participants in a man-machine simulation recognize potentially ruinous event-interaction patterns, and what steps they take to avoid disasterous outcomes. All of the other research questions mentioned above are generated from this initial one. Some important design considerations are: (1) the need for subjects to monitor a fairly complex, though manageable, international environment; (2) the need to employ a model of that environment rather than attempt to deal with the environment directly; (3) the model should generate data for an international environment which resemble the world of diplomacy and high politics more closely than what has been the case in other man simulations; (4) the Ss should be able to affect the pattern of event-interaction through their own acts and stave off a threatening condition they deem undesirable; (5) the Ss should not be permitted the luxury of immediate feedback as to how and when their behavior affected the stream of events; (6) the entire simulation should be laden with qualities of dynamic change, that is, the system should always be in a constant state of flux; and, (7) Ss should be permitted a full range of action-interaction behavior in their efforts to alter a pattern they identify as potentially ruinous.

The man-machine simulation consists of ten three-person experimental groups which are assigned the task of monitoring the event-interaction of an international system consisting of twelve actors. The event-interaction sequence

they will monitor is synthetically constructed and
represents two years of future interactive behavior for
these actors. As the future is synthetic, it is constructed
to conform to a predetermined path specified by the analyst.
Intervals of the future event-interactions are presented to
the subjects who themselves represent one of the major
actors in the system. The subjects assume the roles of
special   political-military   "watch-officers"   whose
responsibilities are to track the behavior of the system and
initiate any acts they deem necessary to protect the nation
they   represent   from   undesirable   conditions.   The
determination of an undesirable state is left to the
individual subject's discretion. The subjects will be
instructed   to   draw   on   their own familiarity with
international affairs, and the fact that the synthetic
future's first day is "tomorrow," to give context to their
country's national interests. Each subject will be aided by
the   fact   that   he   represents   one   of   the   three
superpowers,--the United States, the Soviet Union or China.
It will be of constant interest to the analyst to know how a
subject defines his interests and what an undesirable state
is. These data will be obtained through periodic PROBES and
the information stored for future analysis.

    Each subject interacts with the others and with the
synthetic history via an interactive PL/1 program at one of
three remote terminals. At these stations all of the
necessary communication can be conducted effectively. The
terminals   will   receive   the   following: the   different
intervals   of   synthetic   international   interaction;   all
event-interaction between the experimental subjects; all
their   negotiations;   and,   all tabular and time-series
displays of the data requested by the participants to help
them in their recognition of the state of the system. An
interval of future interaction is presented chronologically
to the subjects. The form of this future conforms to the
standard event-interaction format: who does what to whom.
The   interval can be interrupted at any time by any
participant.   These   interrupts   allow   the experimental
subjects to affect the synthetic system by their own
efforts. They may be unilateral, bilateral or multilateral
in   character; they may involve singular acts, or an
action-reaction sequence.

    As stated previously, the purpose of this study is to
determine if Ss in a simulation using synthetic data can
recognize a situational threat, and if so, can or will they
act to stave off the undesirable conditions forecasted by
those situational threats? The subjects' recognition of the
state   of   the   'stem and their event-interaction are,

therefore, the principal elements in the formula to alter the determinate path of TRASS. Ideally, subjects will recognize the situational threats and act collectively to change the system's determinate course. This, if done consistently throughout the simulation, would produce a simulated, synthetic future which is always in a steady state. Such a task would be terribly demanding. It would require high consensus among the subjects over the state of the system, the means needed to maintain a particular state, and the desirability of doing so. Less ideally, the subjects will either not recognize the different states of the system or they will disagree about it. Furthermore, their event-interaction will not be "sufficient" to alter the determinate path of TRASS.

The range of political, diplomatic, economic and military event-interaction available to the Ss is described by the WEIS event codes (See Appendix A). To determine whether the Ss have altered the determinate course of TRASS, a formula exists which calculates the subjects' systemic impact on the simulated future. Systemic impacts are computed automatically at the end of each interval of future. An interval is a varying length of time, but generally it ranges from 6 to 14 days. The values of the systemic impact determine if the system is constrained, unaffected or accelerated. (See Figures 1-5) If the value is sufficient to constrain the system, then the next interval of future is less threatening and will, if maintained, eventually return the system to its steady state. Exactly how and when the system is returned depends on what state it is in and what the interval is. The systemic impact value may also act to accelerate a state of the system. Figure 1 Steady State of TRASS and its Lines of Constraint and Acceleration shows the determinate steady state trajectory and its alternative paths of acceleration and constraint. The high acceleration line describes a path where the systemic impact values were unduly conflictual and prematurely terminated the steady state of the system.

Subjects are unaware of the end of intervals or that a systemic impact (SI) value is calculated at that time; nevertheless, the next interval of future depends on this calculation. The SI formula is:

SI=(Protocols/No. of Event-Interactions) + RSS

where Protocol is the numerical value of the event-interaction between the subjects during the interval (See Table 1 and 2); and, RSS is recognition of the state of the system.

The term "protocol" is used to describe the form and sequence of event-interaction behavior between the experimental subjects. A protocol is a record of the input-output behavior of the subjects. Ashby has used the term protocol in this way, and its adoption here conforms with his definitions and uses. (Ashby, 1956:88) The protocol is used to track the event-interaction behavior of the Ss and isolate its impact on the dynamics of the simulated future. An example of a protocol is:

Time	The Protocol (over time) Input	Output	No. of Event-Interaction
1	S1 accuses S2;	S2 denies S1	1
2	S2 warns S1 ;	S1 threatens S2	1

The importance of the protocol is that it weighs the influence of the input-output behavior of the subjects, over time, on the simulated future. The numerical value for this protocol is done automatically by the program by using Tables 1 and 2 as look-up matrices. The protocol values for the example above are:

(Input,Output)	=	Protocol value
(Accuse,Deny)	=	2.740
(Warns,Threatens)	=	2.495

The protocol values in Tables 1 and 2 were generated by using a modification of Calhoun's friendly-hostile scale of the event codes. Using Osgood's semantic differential technique, Calhoun constructed a conflict scale based on judges' subjective ratings of each item along a friendly-hostile dimension and the arithmetic distances between each event (the latter being achieved through the use of n-dimensional geometric techniques). (Calhoun, 1971a; Calhoun, 1971b) A constant of +5 was added to each of Calhoun's values to eliminate the negative values for convenience for processing. The actual values were computed by adding the scale values for two event codes, e.g. accuse and deny at 2.347 and 3.134 respectively, and dividing by 2. The resultant, 2.740 in the example, then is a function of symmetrical interactive effect of the two event scale scores on one another. The protocol values in Table 2 are the inverse of those in Table 1 The Normal Protocol Values. The difference is because TRASS allows for the use of conflictual event-interaction to constrain TRASS under

certain conditions (See Appendix B).

RSS,   or   recognition of the State of the System, is a subjective response by each of the respondents. There are objective measures of recognition in TRASS but they will be used in the analytic procedures and not in determining the systemic impact values. The first task at the beginning of each evaluation interrupt is for the subjects to REPORT: (1) the current trend (state) of the system, (2) how long the system is expected to follow this trend (3) a short term subjective prediction of where the system is headed(2-6 days), and (4) a long term prediction (one week or more). The subjects will be provided a list of key words and adjectives they may use to describe the system. Each key word will describe one and only one state of the system. For example when describing a trend or state of the system, the words "downward" and "upward" would refer to the downward diagonal state and the upward diagonal respectively. The PL/1 program scans these trend descriptors and compares them with the actual state of TRASS. Where the descriptor matches the state, the subject is said to have properly identified the state of the system. RSS depends on all three Ss. If all the Ss recognize the systems' state a value of 1.788 is assigned to RSS. Each subject who recognizes the state contributes one-third of 1.788 to RSS. The value 1.788 is equivalent to one standard deviation of the distribution of protocol values. It is an arbitrary value, but since all SI values are transformed to normalized transition values based on the normal distribution of protocol values, the standard deviation seems a legitimate value to use. This procedure translates recognition into a numerical value which can appreciably affect the SI value. Recognition of the system can be an independent matter or the subjects can try to affect one another's perceptions of the system. However, the Ss are not informed about one another's REPORTS nor does the system ever explicitly feed back information about the accuracy of their perceptions. Feedback comes only in the form of the next interval of future.

History,   meaning the subjects' past record of response to the simulated future, is also part of the SI calculation; however, it is handled in the Transition Probability Value Tables rather than in the formula itself. Both the most recent past and the traditional responses of the subjects are taken into consideration in the construction of these tables. The guideline for treating history in TRASS is that once a particular trajectory commences it becomes increasingly more difficult to change. History does not, however, lock the subjects into one trajectory from state to state. The role of history is modified by initializing it to

zero at the beginning of each new state. This means that history is very influential during the playing out of a state's trajectory of event-interaction, but the character of that influence is allowed alteration at the beginning of each new state.

Once the SI value is calculated, the range is .956 to 9.343, it is normalized and transformed to a value between .00 and 1.00. This normalized value is referred to as the transition value. It is actually the transition value which is passed through a filter, known here as a quantizer, and a decision made about which module of synthetic future will be allocated for the next interval of future. (For a discussion of quantizer circuits see Papoulis, 1965: 122) The quantizer is designed to test the transition value against the probabilities associated with accelerating, constraining, or not affecting the system's determinacy.

At this point, an understanding of the actual mechanics of the simulation would best be served by looking at Figure 1 and reading through the following steps.

Step 1:
A pool of thirty experimental subjects is selected, tested for personality profiles and socio-economic backgrounds, trained to understand event data information, both in tabular and time series form, and instructed relative to the simulation exercise.

Step 2:
At each simulation session, three subjects are positioned at separate, remote terminal stations (along with a terminal operator) where information will be both received and transmitted.

Step 3:
Once in place, TRASS will simultaneously commence transmitting daily event-interaction records of the twelve actor system under inspection.

Step 4:
If at any time during this transmission one or more of the subjects wishes to interrupt the session, TRASS will terminate its futures input feed and process any event-interaction between the subjects.

This   event-interaction   is   recorded   for
processing   during   the   simulation   (that is in the
construction of   protocols for the calculation of
system impact values), and stored for future
analysis after the simulation terminates. (There
is an important difference between the processed
protocols and the stored protocols: namely that
the   former   is   composed of two elements, and the
latter   consists   of   three--the   character of the
input   future,   the input behavior of one subject,
and the output response of another.)

Step 5:

When   a   time   interval   ends,   an evaluation
interrupt is performed. Here, the systemic impact
(SI) value is computed and transformed to a
normalized transition value ranging from .00 to
1.00.   This   value   is   then   processed by the
quantizer   and   a decision made as to which module
of event-interaction future is allocated next. The
decision   is   based   on   the probability of moving
from the present condition to the next condition.

Step 6:

The   new   future   is   then transmitted to the
subjects   and the process repeats itself until two
years of future have elapsed.

Data Management and Analysis

A voluminous amount of data will be generated during
this   man-machine   simulation.   The   purpose of a highly
interactive time-sharing procedure is not only to handle the
problems   of   inter-subject   exchange,   and   futures
presentation,   but   to   probe   for additional subjective
insights, and to record, for future analysis, the entire
simulation. The types of data recorded include:

(1) the synthetic future as input, (stimulus) and
the subjects' event-interaction as output
(response);

(2) the sequence of event-interaction between
subjects, (protocol);

(3) the overall interaction behavior of the
subjects as a triad;

(4) the form and content of all communication
between subjects, especially during
negotiations;

(5) the subjective evaluations of the synthetic
future (generated in the Reports) and
perceptions of the strategies and tactics
employed by the subjects (via PROBES
during the simulation);

(6) the socio·economic backgrounds of each
subject; and,

(7) their personality profiles.

Data items 1-5 are particularly important to the
cybernetic analysis. Each is measured over time thereby
permitting patterns, and changes in pattern to occur. It is
these changes and patterns that cybernetics is designed to
analyze. The methods for cybernetic analysis employed here
are a modified version of those in Ashby's AN INTRODUCTION
TO CYBERNETICS. They are concerned with the recognition of
pattern in a determinate system (machine) and
transformations from one pattern to another. This type of
analysis is, in its strictest form, applicable only to
systems which are determinate, where the steady state has
known properties, and where changes in the system (i.e.,
transformations) are closed, and single-valued. A closed
transformation is one where every element in the change from
one condition to the next was actually present, or
inherently present, in the original condition. A
single-valued transform exists when an element (an "operand"
in Ashby's terminology) changes to one and only one
transform. For example in the case of TRASS, if each state
is unaltered by the event-interaction of the subjects then
the determinate, closed, single-valued transformation of the
system is: steady state to upward diagonally to lull to
crisis to systemic disturbance to downward trajectory. This
transformation may be represented as:

$$T: \downarrow A\ B\ C\ D\ E\ F$$
$$B\ C\ D\ E\ F\ A$$

TRASS can, however, be altered. An altered TRASS ceases
to be strictly deterministic, and becomes probabilistic.
Movement from one condition to another "within" a state of
TRASS is a function of probability. One of Ashby's principal
arguments in AN INTRODUCTION TO CYBERNETICS is the idea that
the procedures for studying change in a determinate, closed,
single-valued system can be applied to a probabilistic,
non-single-value system.

Should the system not be determinate,

i.e. the transformation not single-valued, he (the scientist) can proceed in either of two ways.

One way is to alter the set of inputs and outputs--to take more variables into account--and then to see if the new system... is determinate. Thus a chemist may find that a system's behavior is at first not determinate, but that when the presence of traces of chloride is taken into account it becomes determinate. A great deal of research consists of such searches for a suitable set of variables.

A second way is to abandon the attempt to find strict determinacy and to look for statistical determinacy, i.e., determinacy in averages, etc. The experimenter, with extensive records available, then studies them in long sections to see whether, if the details are not predictable from section to section. He may find that the records show the statistical determinateness of the Markov chain...To summarize: once the protocol has been obtained, the system's determinateness can be tested, and (if found determinate) its canonical representation can be deduced. (Ashby, 1956: 90-91)

TRASS, in as much as it is synthetic, has pre-designed properties of determinacy and probability. Whether a state transforms from one state to the next is probabilistic, but the determination of which state the system actually transforms to is determinate. The unconstrained, unaccelerated TRASS transforms thusly: A --> B --> C --> D --> E --> F --> A. A constrained TRASS causes the system to move from whatever state it is in to a new steady state sequence. Once a new steady state is activated, the entire process commences anew. An accelerated TRASS follows the same determinate state transformation trajectory of steady state (a) to an upward diagonal (B) to the lull (c) to a crisis (D) to an absorbing disturbance (E) to a downward trajectory (F), and finally, to a new steady state (A). The difference between an accelerated and a determinate TRASS is the increased speed (in time) at which the accelerated TRASS passes through its states. The probability factor of TRASS allows for the system's equifinality. Conditions within intervals are arrived at probabilistically. As mentioned before, each new interval of future is allocated on the

basis of the probability of moving from one condition within the state to the next as a function of: the protocols, recognition, present condition and past behavior during a particular state of the system.

Variety can be handled in such a system because all of the alternative paths of the system can be defined probabilistically. The bounds of variability are circumscribed and enveloped; the only analytic task is to encode the variety into regular, repetitive behavior and change sequences. One of the major tasks is to demonstrate how cybernetics can be used to provide this information.

The Personality and Perceptual Measures

Much has already been made of the import of personalities in political research. The effect of personality on conflict-cooperation situations has been documented in many different studies. (Terhune, 1968, 1970; Druckman, 1967, 1968; Wrightsman, 1966; Geis, 1964; Beal & Taylor, 1974) The effect of personality is not always a dominant factor (Walton & McKerfie, 1964) but the suggestion made by Beal & Taylor (1974) that a transaction model of the impact of personality on the management of conflict seems to have considerable merit and is worthy of further research. However, the principal reason for identifying the personality structure of experimental subjects is to enrich the information available to the analyst about the subjects in the simulation. Recent psychological studies of prominent political figures have demonstrated that tremendous insights can be gained by knowing in some detail the personalities of prominent decision makers. (Barber, 1968, 1972; Rogow, 1963, 1969; Greenstein, 1969; Greenstein & Lerner, 1971; Mazlish, 1972; Hargrove, 1966)

The critical problem here is to determine what personality variables are really of interest in this particular man-machine simulation. For the moment the idea of a non-projective test, such as the California Psychological Inventory, seems appropriate because such a test is relatively easy to administer and provides an adequate clinical profile of the experimental subjects.

The perception testing, whose importance has also been mentioned previously, is primarily designed to give a time series account of the way Ss view the dynamics of the simulation. Through a battery of questions, the objective is to determine the changes in the Ss view of: 1) the event flow, 2) the situational threat, 3) his own strategy, 4) the strategy of the other subjects, and 5) the goals he ascribes

to himself or to the others. The relationship between the
perceptions of one subject, his counterparts, and the
analyst's view of the objective features of the simulation
will give invaluable clues for determining the
characteristics of the threat recognition process. The
assumption is made that these perceptions are not static,
but have dynamic qualities to them. Constant probes will be
made during the simulation to get the "over-time"
perception, that is a constantly changing perception of the
entire simulation.

Conclusion

TRASS is a highly complex simulation of an
international threat system. Its components are by design
highly interactive and interdependent. As a simulation of an
international threat system, it should be viewed
holistically, bearing in mind that to divide it into its
component parts would be to commit Beer's error of
"divisio." (Beer, 1960) The system can not be understood by
arbitrarily dividing it into parts; to do so, would strip
its internal dynamics and uniqueness. In a word, it would
cease to be TRASS.

The experimental subjects, whose behavior is
intertwined with TRASS' high degrees of interrelationship
and interdependence, are not confronted with a strict
problem-solving exercise. To the contrary, the system
requires monitoring and controlling; it has no solution,--it
only has change. Control, regulation and monitoring are the
only tasks the subjects have. Control of TRASS, the subjects
ultimate objective, means to constrain the system from
ending in disaster. Such control is exerted through behavior
and not by switches. And the more time that elapses in the
simulation, the more TRASS becomes "infested" with the
behavioral inputs of the experimental subjects;
consequently, the longer they monitor and interact with the
system, the more they are actually looking at themselves.
The degree to which TRASS is self-regulating is dependent on
the degree to which the subjects exert restraint on their
own behavior.

TRASS, as a simulated international threat system,
makes no pretext of having a real world referent. It is,
however, based on a set of assumptions which could be
comfortably ascribed to some states of the international
system. These assumptions are numerous, but would include
the following assertions.
(1) The arrangement of nation-state actors
reflects a high degree of inter-dependence and

inter-relationship.

(2) The arrangement of actors can be meaningfully described as a "system" and using the concepts of systems theory. (Beal, 1974)

(3) The international system periodically experiences conditions which can be treated as "situationally threatening" to one or all of the actors in the system.

(4) An international threat system will in all likelihood, not emerge "ex nihilo," but will evolve out of a context of antagonism and conflict.

(5) It is reasonable to suggest these antagonisms will emit signals or warnings which can be detected by a careful observer with special skills.

(6) An international threat system has a dynamic all its own, and once permitted to unfold, will, if unabated, terminate in ruin for all concerned.

(7) There are no well recognized "switches" which can be thrown to control or regulate an international threat system; and there is no recognized authority responsible for control.

(8) It is, however, possible to control or restrain an international threat system.

(9) Control is really exerted only through the behavior of actors in the system.

(10) Feedback containing information about how the behavior actually affects the system comes only in the form of future behavior of the system.

(11) Therefore actors are forced to comb out "information" about how their behavior affects the system.

(12) The more actors attempt to exert control over an international threat system, then the more they are looking at themselves and their own behavior in the stream of future international events.

(13) The most frequent outward manifesta-
tions of an international threat system is
incessant variety and constant change.

(14) There is pattern in the variety
however; the problem is to encode the system's
output in such a way as to isolate patterns and
changes from one pattern to another. Pattern
is assumed because without repetitive behavior
of some sort there is no possibility whatsoever
of ever understanding the system.

(15) Change is the most important empirical
measure and analytic construct for an inter-
national threat system, or for any system.

(16) No scenario of events is known, and no
guides exist to singularize the attention of
the participants on the principal components
and forces in the system. Identification of
salient actors, forces, patterns, etc. is
always a matter of discovery through monitoring
the system over time.

(17) A major task of any actor is to encode
the variety and reduce it to a manageable level.

(18) The purposes for monitoring and
controlling can be highly variable, complex and
changing. But they are invariably connected in
t e final analysis with stability, the state of
least stress, and survival, the state of maximum
physiological order.

These assumptions are undoubtedly supported by a set of
yet implicit assumptions about the science of international
relations,   methodology,   causality   and   other   relevant
matters; these eighteen form only the conscious list used in
TRASS as it now stands.

One final point remains: why study an international
threat   system   from   a   cybernetic,   synthetic   simulation
perspective? What is accomplished through such an exercise?
The reasons for "non-data" dependent simulations have been
advanced by many others and need not be restated here. The
reasons for a synthetic data base, or what might be called a
scenario-free simulation, is a new concept and suggests how
the event data approach can be used to augment simulation
exercises. On this point, McClelland has already commented

that:

> Event simulations carry the promise of
> facilitating the analysis of possible futures
> just   as   the   scenario-centered   gaming
> exercises have done. They differ from the
> latter in just a few basic respects: (1) they
> bring a larger volume of projected data into
> use, (2) they utilize to a far greater extent
> computerized   files   and   data   management,
> selection, and retrieval procedures, (3) they
> emphasize more heavily the processes through
> which international system changes occur, (4)
> they impose heavier requirements of analysis
> and decisional judgment on the participants
> in gamirg exercises and (5) they modify and
> sometimes   eliminate   the adversary format --
> of   team   playing   against   team   that
> scenario-centered   political-military   games
> have   most often featured. Despite these
> differences, it should be emphasized that
> event simulation is not a movement directed
> at   the   destruction   of   scenario-centered
> exercises. (McClelland, 1973a: 2)

A synthetic event simulation offers an alternative
approach to scenario-based simulations. A new challenge is
created for experimental subjects in an event simulation
where they must decide what is threatening about the flow of
international behavior rather than being told what the
problem is.   Crisis management becomes broader, and in a
sense more realistic, because participants must first
recognize a situational threat before they can act to
control it. Furthermore, the participants' attempts at
control in the simulation are absorbed into the total
behavior of the system rather than isolated and treated as
distinct in some way. The system responds dynamically rather
than statically to the participants. Their attempts at
control are swept up into the unfolding future giving them a
past, present and future context. Participants are not
permitted the luxury of knowing exactly how their behavior
affects the system, or the time to weigh all of the
information, or to have total "interactive control" over the
outcome of the crisis. A more meaningful range of
alternative outcomes with more decision points is possible
in a synthetic event future than in a scernario-dependent

simulation.

The cybernetic design, construction, execution and analysis of the synthetic simulation grounds the procedure on a set of assumptions which are common to each state of the procedure. Feedback, self-regulation, control, recognition, equifinality, high interdependence, high complexity, high variety are interwoven into each step of the exercise. What is totally free to vary with each group of experimental subjects are the patterns of repetitive behavior and the changes from one pattern to the other. It is pattern and change that the cybernetic approach is constructed to isolate and analyze. Once the procedures for accomplishing the cybernetic analysis of a synthetic international threat system are understood, then a major step will have been taken toward applying such procedures to a real system.

TABLE 1. NORMAL PROTOCOL VALUES FOR ALL STATES OF TRASS.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	8.387	8.167	8.083	7.977	7.952	7.950	7.314	7.202	7.053	6.747	6.158	5.859	5.790	5.760	5.702	5.367	5.251	5.162	5.103	5.022	4.542	4.671
2		7.947	7.863	7.756	7.732	7.720	7.094	6.982	6.833	6.527	5.938	5.639	5.570	5.540	5.482	5.147	5.031	4.942	4.883	4.802	4.722	4.451
3			7.780	7.674	7.649	7.647	7.010	6.899	6.750	6.444	5.855	5.555	5.486	5.457	5.399	5.063	4.948	4.859	4.799	4.719	4.729	4.368
4				7.568	7.543	7.541	6.904	6.793	6.644	6.338	5.749	5.450	5.380	5.351	5.293	4.957	4.842	4.753	4.693	4.613	4.532	4.262
5					7.518	7.516	6.879	6.768	6.619	6.313	5.724	5.425	5.355	5.326	5.268	4.932	4.817	4.728	4.668	4.588	4.507	4.237
6						7.514	6.877	6.766	6.617	6.311	5.722	5.423	5.353	5.324	5.266	4.930	4.815	4.726	4.666	4.586	4.505	4.235
7							6.241	6.195	5.980	5.674	5.085	4.786	4.717	4.687	4.629	4.294	4.178	4.089	4.030	3.949	3.869	3.598
8								6.018	5.869	5.563	4.974	4.675	4.605	4.576	4.518	4.182	4.067	3.978	3.918	3.838	3.757	3.487
9									5.720	5.414	4.825	4.526	4.455	4.427	4.369	4.033	3.918	3.829	3.769	3.689	3.608	3.338
10										5.108	4.519	4.220	4.150	4.121	4.063	3.727	3.612	3.523	3.463	3.383	3.330	3.032
11											3.930	3.631	3.561	3.532	3.474	3.138	3.023	2.934	2.874	2.794	2.713	2.443
12												3.332	3.262	3.233	3.175	2.839	2.724	2.635	2.575	2.495	2.414	2.144
13													3.193	3.163	3.105	2.770	2.654	2.565	2.506	2.425	2.345	2.074
14														3.134	3.076	2.740	2.625	2.536	2.476	2.396	2.315	2.045
15															3.018	2.682	2.567	2.478	2.418	2.338	2.259	1.987
16																2.347	2.231	2.142	2.083	2.002	1.922	1.651
17																	2.116	2.027	1.967	1.837	1.806	1.536
18																		1.938	1.878	1.798	1.717	1.447
19																			1.819	1.738	1.658	1.387
20																				1.658	1.537	1.307
21																					1.497	1.226
22																						.956

TABLE 2. INVERTED PROTOCOL VALUES FOR ALL STATES OF TRUSS.

|	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	.956																					
2	1.226	1.497																				
3	1.307	1.537	1.658																			
4	1.387	1.658	1.738	1.819																		
5	1.447	1.717	1.798	1.878	1.938																	
6	1.536	1.806	1.887	1.967	2.027	2.116																
7	1.651	1.922	2.002	2.083	2.142	2.231	2.347															
8	1.987	2.259	2.333	2.418	2.478	2.567	2.682	3.018														
9	2.045	2.315	2.396	2.476	2.536	2.625	2.740	3.076	3.134													
10	2.074	2.345	2.425	2.506	2.565	2.654	2.770	3.105	3.163	3.193												
11	2.144	2.414	2.495	2.575	2.635	2.724	2.839	3.175	3.233	3.262	3.332											
12	2.443	2.713	2.794	2.874	2.934	3.023	3.138	3.474	3.532	3.561	3.631	3.930										
13	3.032	3.330	3.383	3.463	3.523	3.612	3.727	4.063	4.121	4.150	4.220	4.519	5.108									
14	3.338	3.608	3.689	3.769	3.829	3.918	4.033	4.369	4.427	4.456	4.526	4.825	5.414	5.720								
15	3.487	3.757	3.838	3.918	3.978	4.067	4.182	4.518	4.576	4.605	4.675	4.974	5.563	5.869	6.018							
16	3.598	3.869	3.949	4.030	4.089	4.178	4.294	4.629	4.687	4.717	4.786	5.085	5.674	5.980	6.195	6.241						
17	4.235	4.505	4.586	4.666	4.726	4.815	4.930	5.266	5.324	5.353	5.423	5.722	6.311	6.617	6.766	6.877	7.514					
18	4.237	4.507	4.588	4.668	4.728	4.817	4.932	5.268	5.326	5.355	5.425	5.724	6.313	6.619	6.768	6.879	7.516	7.518				
19	4.262	4.532	4.613	4.693	4.753	4.842	4.957	5.293	5.351	5.380	5.450	5.749	6.338	6.644	6.793	6.904	7.541	7.543	7.568			
20	4.368	4.719	4.719	4.799	4.859	4.948	5.063	5.399	5.457	5.486	5.555	5.855	6.444	6.750	6.899	7.010	7.647	7.649	7.674	7.780		
21	4.451	4.722	4.802	4.883	4.942	5.031	5.147	5.482	5.540	5.570	5.639	5.938	6.527	6.833	6.982	7.094	7.730	7.732	7.756	7.863	7.947	
22	4.671	4.942	5.022	5.103	5.162	5.251	5.367	5.702	5.760	5.790	5.859	6.158	6.747	7.053	7.202	7.314	7.950	7.952	7.977	8.083	8.167	8.387
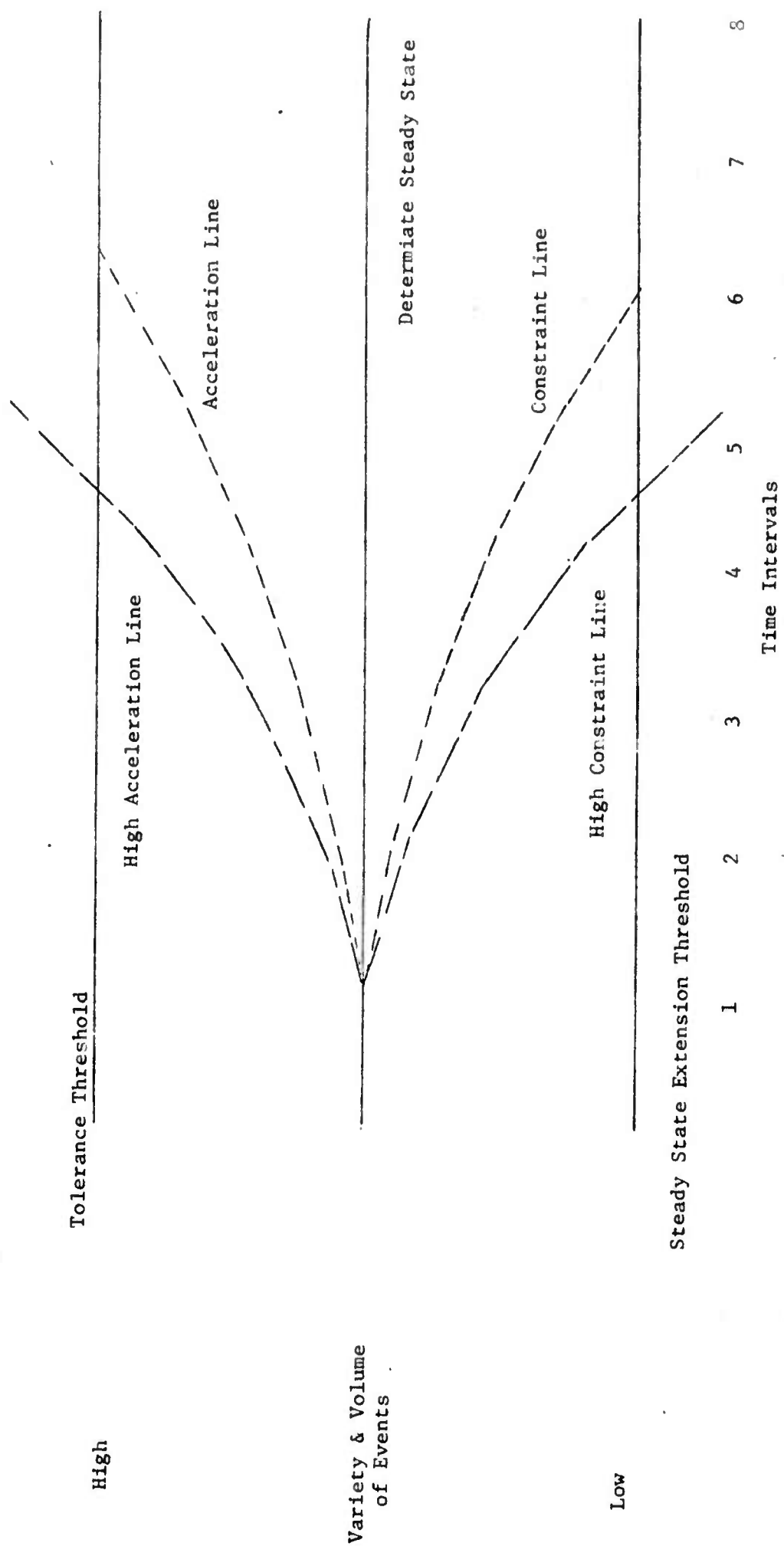
Figure 1. Steady State of TRASS and its Liens of Constraint and Acceleration.
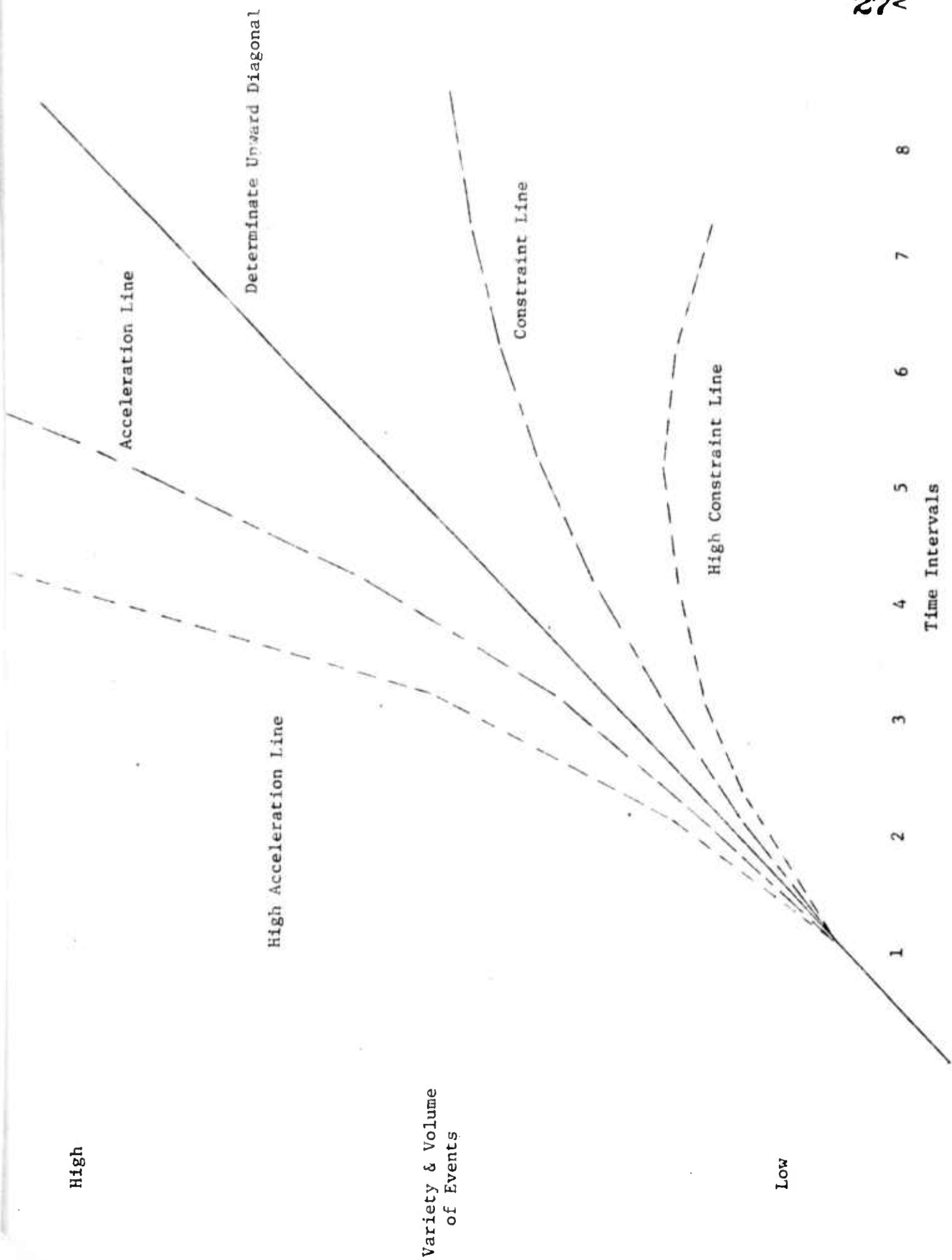
Figure 2. Upward Trajectory of TRASS, and its Lines of Constraint and Acceleration.
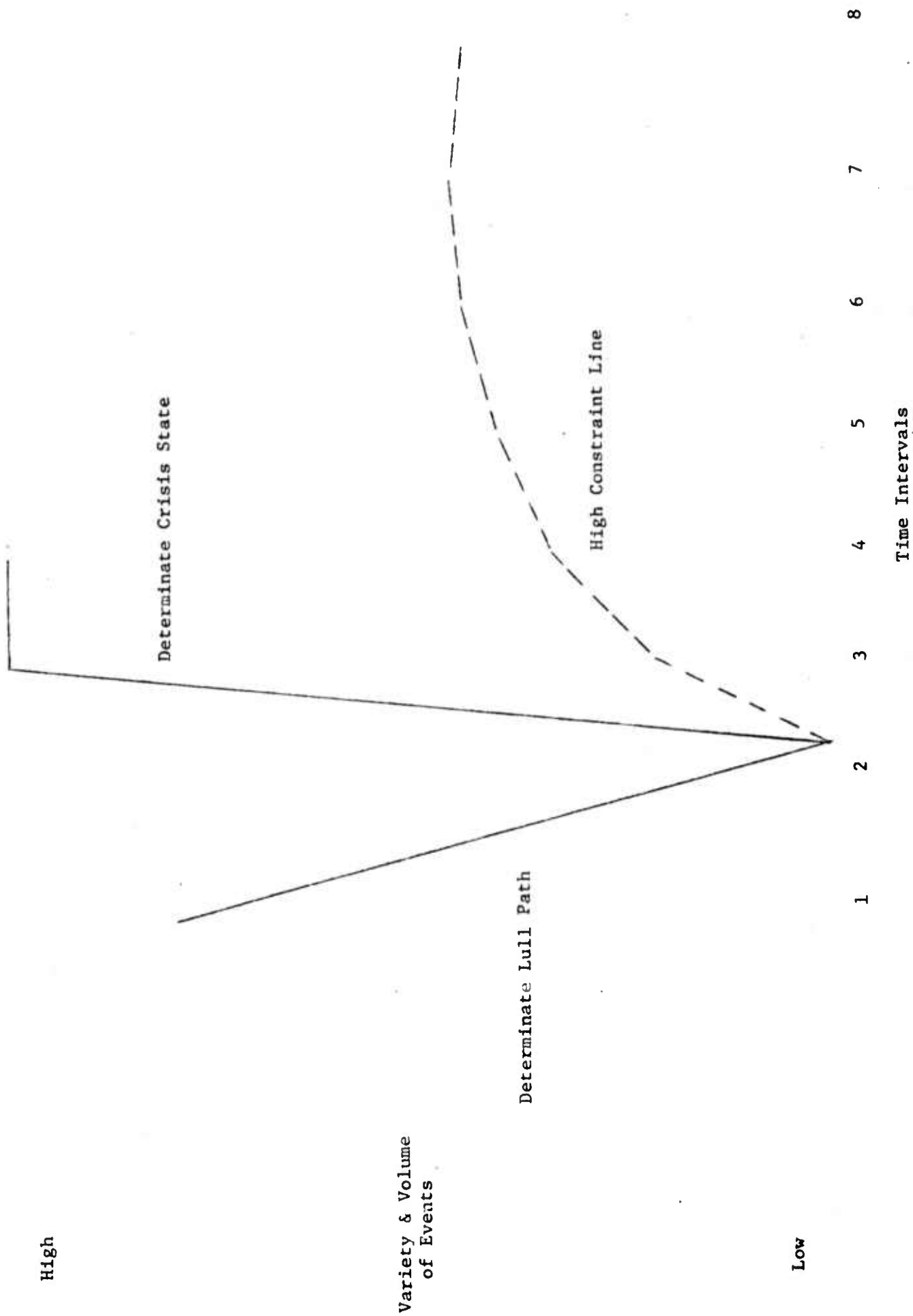
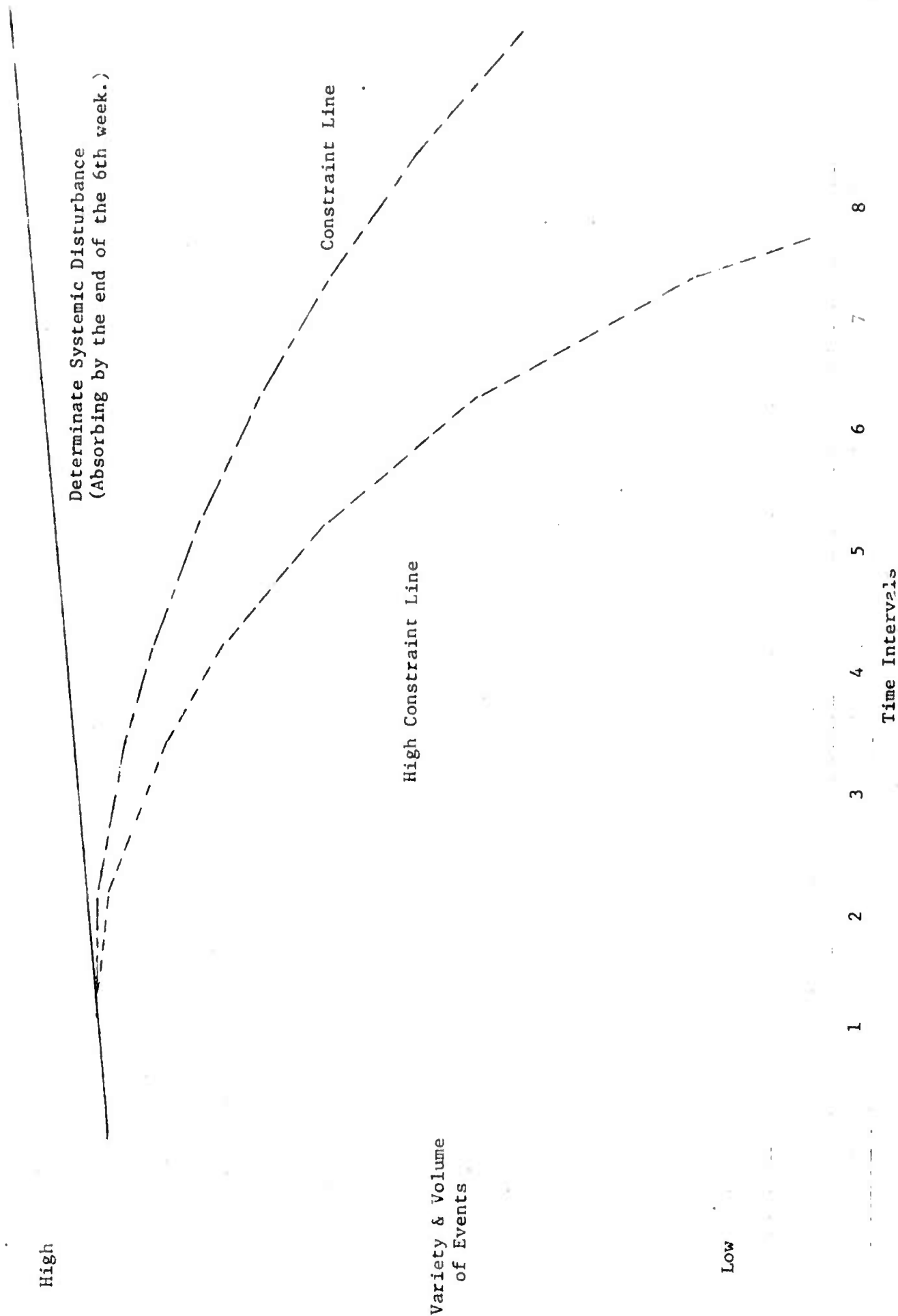Figure 3. Lull and Crisis States of TRASS and its High Constraint Line.

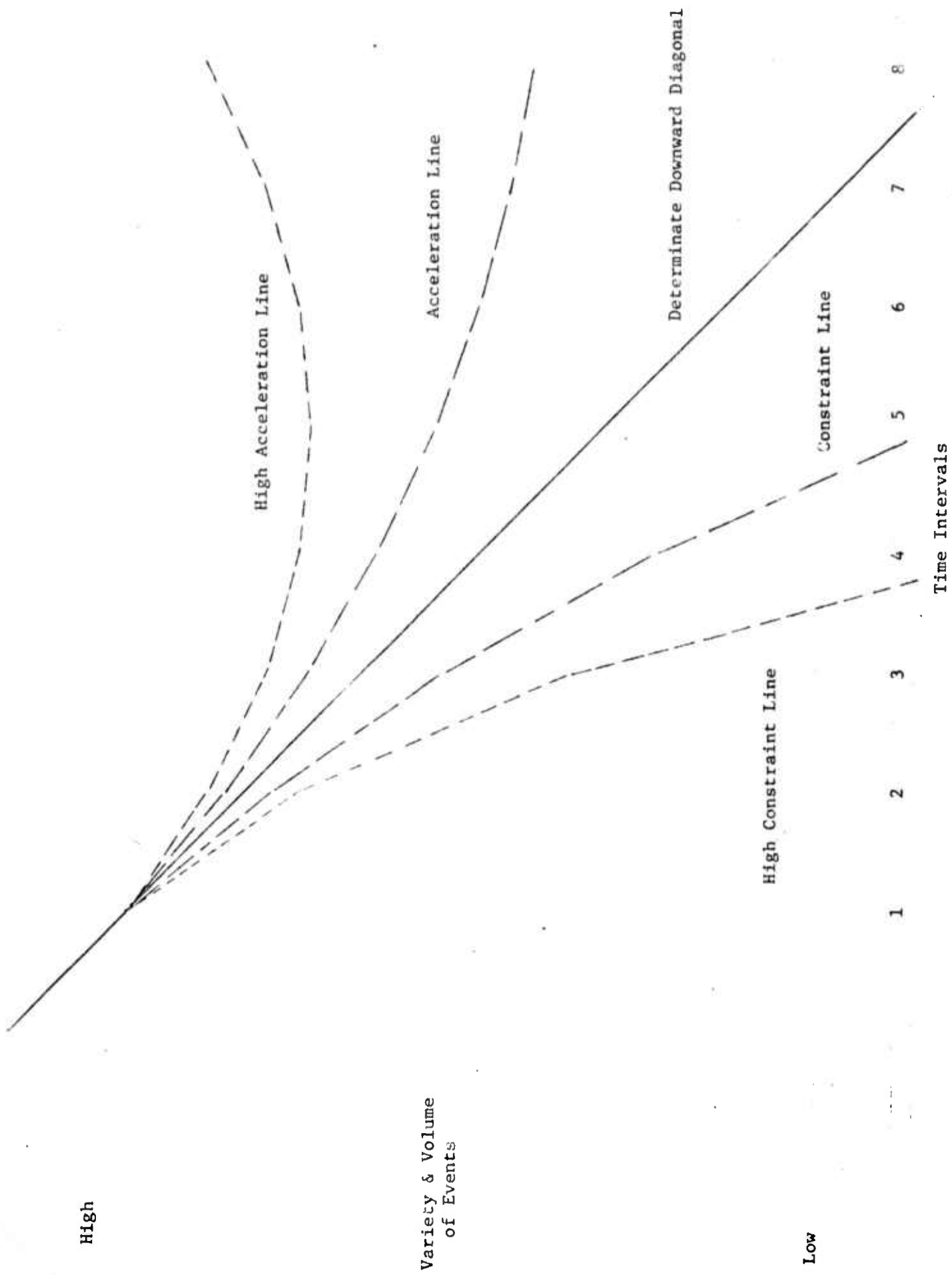Figure 4. Systemic Disturbance of TRASS and its Constraint Lines.

Figure 5. Downward Trajectory State of TRASS and its Lines of Acceleration and Constraint.

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APPENDIX A
EVENT CODES

1. YIELD

    011   Surrender, yield to order, submit
          to arrest, etc.
    012   Yield position; retreat; evacuate
    013   Admit wrongdoing; retract statement

2. COMMENT

    021   Explicit decline to comment
    023   Comment on situation--neutral,
          hope, express concern

3. CONSULT

    031   Meet with, at neutral site; or send
          note, staying in same place
    032   Visit; go to; leave country
    033   Receive visit; host

4. APPROVE

    041   Praise; hail; applaud; condolences;
          ceremonial greetings; thanks
    042   Endorse others policy or position;
          give verbal support

5. PROMISE

    051   Promise own policy support
    052   Promise material support
    053   Promise other future support action
    054   Assure; reassure

6. GRANT

    061   Express regret; apologize
    062   Give state invitation
    063   Grant asylum

    064   Grant privilege, diplomatic recog
          nition; de facto relations, etc.

065   Suspend negative sanctions; truce
066   Release and/or return persons or
      property

7. REWARD

071   Extend economic aid (gift and/or loan)
072   Extend military assistance; joint
      military exercises
073   Give other assistance

8. AGREE

081   Make substantive agreement
082   Agree to future action or procedure;
      agree to meet, to negotiate, accept
      invite

9. REQUEST

091   Ask for information
092   Ask for policy assistance; seek
093   Ask for material assistance
094   Request action; call for; ask for asylum
095   Entreat; plead for; appeal to; help

10. PROPOSE

101   Offer proposal
102   Urge or suggest action or policy

11. REJECT

111   Turn down proposal; reject protest
      demand, threat, etc.
112   Refuse; oppose; refuse to allow;
      exclude; fail to reach agreement

12. ACCUSE

121   Charge; criticize; blame; disapprove
122   Denounce; denigrate; abuse; condemn

13. PROTEST

131   Make complaint (not formal)
132   Make formal complaint or protest

14. DENY

141   Deny an accusation
142   Deny an attributed policy,
      action, role, or position

15. DEMAND

150   Issue order or command, insist;
      demand compliance, etc.

16. WARN

160   Give warning

17. THREATEN

171   Threat without specific negative
      sanctions
172   Threat with specific non-military
      negative sanctions
173   Threat with force specified
174   Ultimatum; threat with negative
      sanctions and time limit specified

18. DEMONSTRATE

181   Non-military demonstration; walk
      out on; boycott
182   Armed force mobilization, exercise,
      and/or display blockade

19. REDUCE RELATIONSHIP (as Neg. Sanction)

191   Cancel or postpone planned event
192   Reduce routine international
      activity; recall officials, etc.
193   Reduce or suspend aid or assistance
194   Halt negotiations
195   Break diplomatic relations

20. EXPEL

201   Order personnel out of country;
      deport
202   Expel organization or group

21. SEIZE

211   Seize position or possessions
212   Detain or arrest person(s)

22. FORCE

221   Hon-injury destructive act,
      bomb with no one hurt
222   Military injury-destruction
223   Military engagement

Appendix B

The Normal and Inverted Protocol Values

The protocol value plays a major role in determining whether TRASS' determinate transformation will play-out. The simple rule for this determinate is: the higher the protocol value, then the higher the probability of constraining the system. The normal and inverted protocol tables are necessary to allow cooperation as well as conflict to constrain TRASS. A system where only cooperative acts constrain would be unrealistic and inappropriate. Conflict protocols constrain TRASS under the following conditions: (1) whenever all three superpowers attempt to constrain the behavior of another actor in the system; (2) whenever two of three superpowers attempt to constrain the aggressive behavior of the third superpower; (3) whenever one superpower acts to constrain any actor in the system and is unopposed by the other superpowers; (4) whenever acts of a conflictual nature are taken by one superpower and unopposed by the other in the upward, crisis or systemic disturbance status to curtail an escalating trend; (5) whenever item(4) is conducted by two of the superpowers and opposed by the third; and, (6) during the last days of the crisis state and last two time intervals of the systemic disturbance state.

Appendix C
The Characteristics of Trass' Six States
The Steady State

1. The steady state of TRASS is its least threatening condition. It is a state where very little stress is present. The system is neither overloaded because of the volume of events nor disrupted by the amount of conflict in the variety mix. Four alternative trajectories to the determinate steady state trajectory exist: high acceleration, acceleration, constraint, and high constraint.

Determinate Steady State Trajectory

2. The determinate steady state trajectory is characterized by a moderate to low volume of event-interaction, and a variety of events which is slightly more cooperative than conflictual. The moving mean volume and proportion of conflictual to cooperative acts remains constant throughout the entire determinate steady state trajectory. Oscillations will of course occur but the volume mean and the variety proportion remain stable.

3. If permitted to play-out, the determinate steady state will last 8 time intervals or approximately 48 days.

4. The steady state's determinate path is a relaxed condition; fluctuations in volume and variety of events do not require adjustment by other elements in the system.

5. The first interval of steady state future can not be changed: this holds true for the first interval of any state.

Constrained Trajectories

6. There are two levels of constraint possible during the steady state: high constraint and constraint. These alternative paths differ in "degree" rather than in kind.

7. Both constrained trajectories reduce the volume of event-interaction in TRASS and reduce the level of conflictual events in the variety mix.

8. The high constraint trajectory terminates the steady state during its fifth future input feed. The constraint path terminates the state at the sixth evaluation interrupt. At these points the "extension threshold" has been encountered and a new steady state is allocated.

Theoretically, the steady state could go on indefinitely.

Accelerated Trajectories

9. The steady state, like other states of TRASS, may be either constrained or accelerated. The accelerated paths, high acceleration and acceleration, prematurely transform the steady state to the upward trajectory state.

10.   High acceleration and acceleration differ in "degree" but both have the impact of increasing the volume of event-interaction and the amount of conflict in the variety mix. They have the inverse effect on the system from the constraint lines.

11.   A high acceleration trajectory intercepts the tolerance threshold during TRASS' fifth future input feed. At that time the system transforms to its upward trajectory state. The tolerance threshold is not encountered on the acceleration path until the sixth evaluation interrupt.

Upward Trajectory State

1. The upward trajectory state contains TRASS' initital inaications of a situational threat. The concert of situational threat has a subjective and objective dimension to it. Subjectively the Ss can perceive a condition to be threatening according to their own criteria for situational threats. Or the subjects themselves may threaten one another. Situational threats may also be generated by the event-interaction of the subjects. The objective situational threat in TRASS is inherent in the volume of events and in the variety. An objective situational threat is operationally defined as an increasing volume of event-interaction over at least two time intervals, and an increasing proportion of conflictual events to cooperative ones.

2. The upward state inherently clues the crisis state.

3. Like the steady state, the upward trajectory has four alternative paths: high acceleration, acceleration, constraint and high constraint.

Determinate Upward Diagonal

4. The determinate upward trajectory is a constantly increasing volume mean. The increases conform to the rates characterized by the diagona' depicted in Figure 2. The proportion of conflict to cooperation also changes.

Proportionately   more   conflictual   acts   are present   in the
latter intervals of future than in the initial ones.

5.   If   permitted   to   play-out,   the determinate upward
state covers eight time intervals.

6.   The   upward   state   is   a   situational   threat; its
increased   volume   and proportion of conflict is threatening
and its path points to a more ruinous future.

Constrained Trajectories

7.   High   constraint   and   constraint,   both reduce the
volume of events and the proportion of conflict in the event
flow.

8.   Each   reverses   the   projection   of   the   state and
returns the system to a new steady state.

9.   High constraint transforms the upward trajectory to
a   new steady state at the seventh evaluation interrupt. The
constraint   path   transforms   the   system   at   the   eighth
interrupt.

Accelerated Trajectories

10. Both high acceleration and acceleration prematurely
transform   TRASS   to   its   lull   state. The high acceleration
path   accomplishes   this   transformation   during   the fourth
future   input   feed.   The transformation occurs at the fifth
evaluation interrupt for the acceleration trajectory.

Lull State

1.   The   lull state is unlike any other state of TRASS.
It happens automatically at the end of the upward trajectory
or   when the tolerance threshold is reached by either of the
accelerated   paths   of   the   upward   state.   It   can   not be
constrained   or   accelerated.   It   conforms   to   the   empirical
observation   in   many   crisis   studies that there is a "lull
before the storm" phenomena in international relations.

2.   The   lull   state   is   6-8   days   long and ends with
absolutely   no event-interaction recorded for the final day.
This lull preludes the crisis state of the system.

Crisis State

1.   The   crisis   state is the second most situationally

threatening condition in TRASS. Violence breaks out between selected actors in the system and threatens to embroil all actors.

2. The crisis is generated in approximately two days and lasts from 7-9 days.

3. The state is characterized by a high volume of activity,   high   proportion   of conflictural acts over cooperative ones during the first few days, with a more balanced variety during the last days of the crisis.

Constraint Trajectory

4. The crisis state can only be highly constrained. The experimental subjects must, if they hope to avert a crisis, be able to constrain TRASS consistently (for four time intervals) before the system will return to a new steady state. When the system is constrained one time and not the next, the crisis occurs.

5.   The   crisis   state depicts a highly volatile international condition, and is a precursor of a more encompassing violent entanglement.

Systemic Disturbance State

1. The systemic disturbance follows a crisis. It is characterized by a very high volume of events with a balanced variety in the early stages of the state. Though attempts at cooperation are frequent, resolution of the conflict   is not forthcoming. The volume remains high throughout, and eventually the conflictual events dominate the flow of international interaction.

The   ultimate   condition   of this state is total embroilment of all twelve actors in violent conflict. This is the final state of ruin in the system. The all absorbing conflict is achieved by the end of the sixth interval.

Constraint Trajectories

3. Again only constraint is possible in this state. Constraint forces the volume of events down and reduces the amount of conflict in the variety.

4. The constraint paths return the system to a new steady state; high constraint achieves this at the sixth interrupt and constraint at the eighth.

Downward Trajectory State

1. The final state of TRASS is the downward trajectory. Its determinate downward diagonal reduces the volume of events, and balances the variety.

2. Its function is to return the determinate pattern of the system to a steady state.

Downward Diagonal Trajectory

3. This path constantly reduces the mean volume of events along the path described in Figure 5.

4. The state's determinate time duration is 8 intervals.

Constrained Trajectories

5. These constraint trajectories serve the same function as those in other states.

Accelerated Trajectories

6. If the downward state is accelerated an exception to the

T: ↓ A B C D E F
     B C D E F A

transformation rule is produced. In this case, the steady state is by-passed, and a new upward trajectory commences.

Appendix D

Experimental Subjects

No   specific   type   of   subject   is   desired   in   this
simulation   except   for   the   general specification that the
subjects   be   generally aware and sensitive to international
relations.   This   sensitivity   will   be   determined   in   an
interview   with   those   subjects   responding   to   the public
advertisement   for   subjects.   Once   the thirty subjects are
selected,   a thorough attempt will be made to identify their
socio-economic   backgrounds   and their personality profiles.
The   position   is taken that a detailed profile of volunteer
subjects   is   more   important   than   pre-selecting   a
socio-economic or personality type.